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IONOSPHERIC DISTURBANCES WITH SUDDEN COMMENCEMENT AND
THE TYPE-IV CHROMOSPHERIC EMISSIONS

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[FRANCE]

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IONOSPHERIC DISTURBANCES WITH SUDDEN COMMENCEMENT AND
THE TYPE-IV CHROMOSPHERIC EMISSIONS *

Comptes-Rendus de
l'Académie des Sciences
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by Fernand Carbenay

SUMMARY

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The relationship between the type-IV chromospheric emissions and the sudden ionospheric disturbances is studied on the basis of the results of observations for the years 1956-1960. It is concluded that in most of the cases type-IV emissions are attended by IDSC if the stations where recordings are made or of radiotelegraphic traffic are in the illuminated zone. A new factor is introduced into the earlier formula [3], defining the intensity of the disturbance as a function of the ratio of the total atmospheric focus activity to those, of which the propagation is affected by the disturbance.

Author

* * *

A meeting due to the initiative of R. Jouaust and presided by Ch. Maurain, then Director of the Institute of Physics of the Globe, took place on 18 November 1936. It was attended by L. D'Azambuja, R. Bureau, Comm. Garnier, R. Jouaust and J. Maire and had for result the establishment of the simultaneity between the events induced by chromospheric flares observed for the first time of France, after confrontation of the registrations of atmospherics and the radiotelegraphic traffic. This has been done by J. Maire concerning the sudden fadings in decametric waves and by J. Bureau for the sudden increases in long (kilometer) waves [1].

* Les perturbations ionosphériques a début brusque (P.I.D.B.) et les émissions chromosphériques (type IV).

A. Boischot defined in 1957 the type-IV emission as the radiation accompanying certain chromospheric flares observed with the large Nançay interferometer [2]. "This radiation," said he, "always takes place after a chromospheric flare; it is generated over 169 Mc/s after the end of a powerful burst, increase in intensity for 20 to 40 minutes, then decreases at a slower pace to disappear only after several hours.

We have searched, with the collaboration of M. Bertrand, whether or not an ionospheric disturbance with sudden commencement (IDSC), characterized either by reinforcement of atmospherics in kilometer waves or by reception fading in decameter waves, corresponds to every type-IV emission.

The documentation relative to type-IV bursts was communicated by the Solar Services of the Meudon Observatory.

The IDSC have been observed in the registration of the level of atmospherics and of the emission field, calibrated at the Network of the National Center of Telecommunication Studies, or mentioned in the Solar Bulletin of the Bureau of Standards, of which only a part was available to us, or still signaled by various reception centers such as Noisseau, Villecresnes, Central Radiotelegraphic Bureau and the Reception Center of Rabat.

The results of observations can be summed up as follows for the years 1956 through 1960.

1956: to 20 type-IV emissions correspond 18 IDSC (reinforcement or sudden fading);

1957: to 61 type-IV emissions correspond 44 IDSC and 14 cases for which the networks of registration or traffic, susceptible of detecting the IDSC were at night;

1958: to 43 emissions of type IV correspond 31 IDSC and 10 cases with night trajectory of IDSC detection;

1959: 38 type-IV emissions correspond to 17 IDSC and 18 cases with night trajectory of IDSC detection;

1960: to 6 type-IV emissions correspond 4 IDSC and two cases with night trajectory of IDSC detection.

We may thus conclude, that in the majority of cases and provided the stations of registration or traffic are in the illuminated zone, the

type-IV bursts are attended by IDSC which are suddenly manifest at the reception either by reinforcement in long kilometer waves, or by fading in decameter waves.

The commencements of the latter do not always appear simultaneously on account of irregularities or difference in apparatus' operation. The amount of information has, at any rate, been reduced toward the end of the IGY. Finally, the observations of type-IV emissions, most probably were not carried out on a permanent basis.

The comparison of mean level increases with the other phenomena implies the necessity of making more precise to the extent possible the epoch of disturbance commencement and the importance of the reinforcement by other means than the standard, which consists in empirical estimate of 1 to 3. We have proposed [3] to define the intensity of the disturbance by a parameter \mathcal{E} equal to maximum increase $(Y_M - y_0)$ referred to level y_0 corresponding to the commencement time of the event

$$\mathcal{E} = \frac{Y_M - y_0}{y_0}.$$

If, aside from foci of atmospherics, whose propagation is affected by the sudden ionospheric disturbances, several other foci are evident in the omnidirectional level registration, a reduction of $(Y_M - y_0)/y_0$ thus results so much the greater that these foci are more active or more numerous.

A radiogoniometric registration of atmospherics, completing the omnidirectional registration, will allow us to estimate during the time of IDSC the ratio k of the total activity of the foci to that of the focus or foci, whose propagation is affected by the disturbance, and to take this into account in the form:

$$\mathcal{E} = k \frac{Y_M - y_0}{y_0}.$$

**** THE END ****

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on 18 - 19 October 1965

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